

**CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH
SCIENCE COUNCIL - OCTOBER 2005**

SUMMARY REPORT ON SYSTEM PRIORITIES FOR CGIAR RESEARCH 2005-2015

The overall goal of the research carried out by the CGIAR and its partners is to improve the livelihood of low-income people in developing countries through reduced poverty, food insecurity and malnutrition, and to foster better institutions, policies, and sustainable management of natural resources of particular importance to agriculture and poor people. The goal is fully compatible with the Millennium Development Goals (MDGs) and is reflected in the priorities for CGIAR research to 2015, and their implementation, reported here.

Identifying Priorities for the CGIAR System: Why and How?

The Science Council (SC) of the CGIAR initiated a process of System-level priority setting in line with its aim to help develop a more cohesive and better-focused, high-quality research program to alleviate poverty, hunger, and malnutrition. There were several reasons for the initiative. First, despite many individual research successes in the past, the CGIAR System can have greater impact through a more consolidated research focus. Second, there is a need to avoid dispersion of research. As the goals of the CGIAR have widened and its total budget has increased, there has been selective funding of a large number of specific projects negotiated with donors. Many such projects address particular (local) research or development problems and do not exploit the core strength of the CGIAR as a research supplier of international public goods. Third, there is a need to mobilize research capacity across the CGIAR System more effectively. Projects addressing difficult issues for sustainable poverty reduction (e.g., smallholder productivity gains in Africa) need sharply focused, long-term, and multi-pronged approaches involving research on different commodities, themes, and disciplines. Fourth, there are opportunities to enhance coordination and cooperation. Centers have already shown increased willingness and capacity to coordinate and cooperate with one another. Well-defined System Priorities will help to develop more effective partnerships with national agricultural research systems (NARS) and advanced research institutes in both the north and the south. Fifth, clearly defined research approaches and routes to poverty alleviation will increase participation by stakeholders in priority setting, and assist donors in allocating their resources to the CGIAR projects with potentially large impacts. Sixth, setting system priorities provides the opportunity to enhance accountability. The Science Council's intention is to link the establishment of priorities (and future priority setting) to monitoring, evaluation, and performance measurement—functions vital for the efficient conduct of agricultural science and to meet the goals of the CGIAR and its global partners.

The priority-setting process consisted of a multi-pronged approach that was both analytical and broadly consultative with stakeholders - including nongovernmental organizations, donors, and scientists both within the CGIAR System and in other research institutions

including NARS and advanced research centers. Building on an assessment of emerging trends and the consultative stage of the priority-setting process, the SC reviewed the total research portfolio of the CGIAR projected to 2015 and sought to focus the CGIAR research agenda on a smaller number of priority areas for research.

The Global Context for CGIAR Priority Setting

World Poverty Concerns. Over the past 50 years, the world has changed fundamentally from one that was predominantly rural based to one where an increasing proportion of the population is living in urban areas. To meet its poverty reduction objective, therefore, the CGIAR will increasingly need to use agricultural research to reduce urban poverty through the resulting economic growth, employment creation, cheaper foods, and improved quality diets. However, the bulk of poverty is still found in rural areas.

Improving agricultural productivity and sustaining natural resources can be of direct assistance to both urban and rural poor through lower unit costs of production resulting in higher incomes for the rural poor and lower food prices for consumers. The very poor tend to be associated with marginal production environments in rural areas. New technologies appropriate for these marginal and risky environments are still largely missing and constitute an evident priority for the CGIAR. Identifying the constraints to small farmers' adoption and use of technology continues to be a high-priority issue for consideration and planning.

Although the share of primary agricultural production contributing to gross domestic product (GDP) tends to decline with development, sustainable productivity improvement through agricultural research remains a key means to assist the poor and marginalized within wider development strategies. The direct as well as the indirect effects of agricultural productivity gains in poverty reduction must, therefore, remain a priority for the CGIAR, particularly in reaching poor farmers, the landless and urban poor.

World Food Concerns. Within the last half a century the food security challenge has changed rapidly. Urbanization and globalization are becoming pervasive, private sector involvement in agricultural research has been increasing rapidly around the world, and global concerns about the sustainable management of resources have been rising. The effects of population pressure and poor land and water use practices are noticeable in the (i) degradation of natural systems such as forests and fisheries, (ii) degradation of intensively cultivated lands, (iii) exploitation and erosion of marginal lands, (iv) water resource depletion, and (v) depletion of genetic diversity. At the farm and landscape levels, it is necessary to target research and development specifically toward technologies that enhance productivity while at the same time conserve resources. Advances in molecular biology, computing, and informatics present new scientific opportunities.

Since the Green Revolution, crop staples have been a key component of nutrition and food security. This will continue as the world population moves towards 10 billion, but the price of wheat, rice and maize will remain relatively low. However, there are many other higher-value food and non-food commodities which ensure nutrition, productivity, incomes, and better livelihoods of farmers, fishers, forest dwellers and pastoralists in developing countries.

Trade liberalization and increased competition facing small farmers mean that the global food security challenge has over time become increasingly multidimensional, and without targeted research to help develop new opportunities, the poor may be affected adversely by the liberalization of global markets. Climate change and instability are projected to become increasingly apparent through the next decades. Developing nations will require assistance to orient agriculture and agricultural practices into less vulnerable choices and pathways.

Many of the CGIAR's major commodities remain critical for developing countries' access to food. Rising food deficits in sub-Saharan Africa and West Asia/North Africa (WANA) are important in rice, maize, soybeans, and low-value fish. Wheat deficits (in all regions except Latin America and the Caribbean) are largely associated with rising urban consumption. Deficits in ruminant meat in WANA, Southeast Asia, and East Asia are predicted to be important. Projections of the future world food situation thus point to a dual challenge. Continued research is needed to improve productivity of staple foods and animal products to meet increasing demand (which can only partially be met through trade). And new emphasis is required to help farmers diversify into non-traditional exports, such as high-value crops, animal products, and fish, as sources of foreign exchange earnings and routes out of poverty.

The vision for the longer term is one in which the CGIAR is a provider of international public goods through agricultural research aimed at the alleviation of poverty. The CGIAR aims to progressively devolve some current research (particularly aspects of breeding for germplasm enhancement and site-specific natural resource management) to NARS with increasing capacity. A range of partners will help devolve research and enhance delivery of outputs to the poor in different localities. The CGIAR will turn its attention toward solving the complex issues that undermine people's attempts to move out of poverty and promoting the success of agriculture in developing countries, using modern research technologies and providing science-based policy advice. Clearly, staging such a strategy will be different in regions where NARS have different strengths. Special attention will be paid to building partner capacity in sub-Saharan Africa.

The Priorities of the CGIAR

The SC employed three criteria to help identify the Priorities:

- (i) the expected impact on poverty alleviation, food security and nutrition, and sustainable management of natural resources, taking into account the expected probability of success and expected impact if successful;
- (ii) the degree to which the research provides international public goods; and
- (iii) the existence of alternative sources of supply of the research and the CGIAR's comparative advantage in undertaking the research.

The priority-setting efforts resulted in a set of 20 research Priorities for the CGIAR, organized within five priority areas (Box 1). The five major groups of strategic research activities aim at producing common outcomes. In aggregate, the Priorities provide a set of specific goals for a portfolio of research activities around which the CGIAR will organize its scientific and related capacities. The Priorities have goals commensurate with the mission of the CGIAR and encapsulate major areas of science within the CGIAR's comparative advantage in its

assistance to developing-country agriculture. Priorities are set so as to have measurable outcomes; specific links can, therefore, be made between priority setting and future monitoring and review functions.

Box 1. CGIAR System Priorities, 2005–2015

Priority area 1: Sustaining biodiversity for current and future generations

- Priority 1A: Promoting conservation and characterization of staple crops
- Priority 1B: Promoting conservation and characterization of underutilized plant genetic resources
- Priority 1C: Promoting conservation of indigenous livestock
- Priority 1D: Promoting conservation of aquatic animal genetic resources

Priority area 2: Producing more and better food at lower cost through genetic improvements

- Priority 2A: Maintaining and enhancing yields and yield potential of food staples
- Priority 2B: Improving tolerance to selected abiotic stresses
- Priority 2C: Enhancing nutritional quality and safety
- Priority 2D: Genetically enhancing selected high-value species

Priority area 3: Reducing rural poverty through agricultural diversification and emerging opportunities for high-value commodities and products

- Priority 3A: Increasing income from fruit and vegetables
- Priority 3B: Increasing income from livestock
- Priority 3C: Enhancing income through increased productivity of fisheries and aquaculture
- Priority 3D: Promoting sustainable income generation from forests and trees

Priority area 4: Promoting poverty alleviation and sustainable management of water, land, and forest resources

- Priority 4A: Promoting integrated land, water and forest management at landscape level
- Priority 4B: Sustaining and managing aquatic ecosystems for food and livelihoods
- Priority 4C: Improving water productivity
- Priority 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas

Priority area 5: Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger

- Priority 5A: Improving science and technology policies and institutions
- Priority 5B: Making international and domestic markets work for the poor
- Priority 5C: Improving rural institutions and their governance
- Priority 5D: Improving research and development options to reduce rural poverty and vulnerability

The SC proposes that the Future Harvest Centers and the CGIAR members agree to allocate (following a transition period not to exceed three years) 80% of the total CGIAR budget for research and related capacity strengthening to the five Priority areas mentioned in this

document. It is recommended that donors provide funding for these priority areas in the future.

To contribute to a dynamic and flexible research environment, the SC suggests that the CGIAR spend up to 20% of its budget outside the System Priorities. It further encourages Centers to utilize at least half of that 20% for exploratory, innovative research work to develop new science and potential new future priorities. The other half of the 20% could be spent on free-standing capacity building or other research-related activities at the discretion of Centers.

The CGIAR research will contribute directly or indirectly to the eight MDGs (Table 1). International publicly funded agricultural research, undertaken by the CGIAR and partners, is particularly effective in helping to achieve MDG 1, the reduction of poverty and hunger, partly by helping smallholder farmers escape poverty, create wealth, and improve their competitiveness in the increasingly globalized marketplace and partly by creating employment among the rural poor and making food available to poor consumers at lower prices. Thus there are four principal ways in which the CGIAR research is prioritized to contribute to this MDG.

Table 1. Direct and indirect impacts of CGIAR priority research on the MDGs

Millennium Development Goals (summarized)		System Priority Areas for CGIAR Research				
		1	2	3	4	5
1	Reduce extreme poverty and hunger	+	++	++	++	++
2	Ensure universal primary education		+	+		
3	Reduce gender disparity		++	++	++	++
4	Reduce child mortality	+	+	+	+	+
5	Improve maternal health	+	+	+	+	+
6	Combat HIV/AIDS, malaria and other diseases		++			++
7	Ensure environmental sustainability	++	++	+	++	++
8	Develop a global partnership for development	++	+		++	++

Note: ++ direct impact; + indirect impact.

First, Priority area 2 will place emphasis on research to help smallholders produce more staple food and fodder per unit of land, labor, and water in an environmentally sustainable manner. Research will include genetic enhancement of selected staple food crops as well as improved agroecological production systems. With time, the CGIAR will transfer an increasing proportion of traditional crop improvement and production research to stronger national agricultural research institutions, focussing its genetic enhancement efforts on leveraging international state-of-the-art science and the development of traits of particular importance to the poor.

Second, Priority area 3 will emphasize research to enhance incomes of smallholders through the production of high-value commodities and products, with emphasis on fruit and vegetables, non-timber forest products, livestock, and fish. Expanded productivity and production of fruit, vegetables, non-timber forest products, livestock, and fish offer great opportunities for income gains for the rural poor partly because of the expected strong future demand for such products and partly because of the opportunities for adding value and employment in processing and other supply chain activities. Improved nutrition and family income underpin the chances to enhance primary education.

Third, research on sustainable management of natural resources is prioritized in Priority area 4 to achieve sustainability and poverty alleviation goals, thus contributing to both MDG 1 and MDG 7 (on ensuring environmental sustainability). The protection of biodiversity through the conservation of germplasm of key food staples, underutilized species, fish, and indigenous livestock (Priority area 1), is given weight along with research on water, land, and forest management and related institutions and policy. Research to help enhance potential positive—and cope with negative—effects of climate change will be prioritized by combining research approaches across areas.

Fourth, research on institutions, markets, and policy is prioritized to assist governments, farmer associations, and others to facilitate effective production, market development, trade, and related changes needed to enhance the benefits to the rural and urban poor. Science and technology policy, as well as policy to support sustainable management of natural resources, will be important parts of the research emphasised in Priority area 5. Research will address institutions, governance, trade, and policies to contribute to the achievement of MDG 8 (developing a global partnership for development).

All CGIAR research will include gender-specific analysis to identify technologies and policies that are likely to enhance gender equality and empower women, thus contributing to MDG 3. Reduced poverty, food insecurity, and malnutrition are linked to reduced child mortality (MDG 4) as well as improved maternal health (MDG 5). Improved nutrition is particularly important for the fight against HIV/AIDS (MDG 6). Furthermore, increased labor productivity to help cope with the effects of HIV/AIDS will be pursued both through genetic enhancement and through sustainable management of natural resources. Thus, while the research Priorities are aimed first and foremost at improved livelihoods and sustainable management of natural resources, they are developed with these related MDGs in mind.

Strategic Implications of the New Research Priorities

The five Priority areas and 20 Priorities presented in this document contain several new elements and approaches (Box 2)¹.

Box 2. Major New Research Emphases in the System Priorities for CGIAR Research, 2005–2015

A re-emphasis of the CGIAR's role in research on major long-term issues
Development of specific Systemwide contributions to the MDGs
Research for development—not development *per se*
Explicit focus on income generation among the poor
New collaborative approach to research on fruit and vegetables
Research on trade, markets, and food safety
Enhanced focus of research on drought, soil acidity, and temperature stress
Application of modern molecular science
Landscape-level approaches to the management of agricultural and natural resources

These new approaches include the following:

- Within the CGIAR's continuing mission and goals, a comprehensive approach to the alleviation of poverty through agricultural research is described, and specific contributions to the global efforts to address the MDGs are identified.
- The Priorities reflect the mandate of the CGIAR to undertake research for development: the priorities exercise attempts to move Centers away from activities which do not produce international public goods and, secondly, to move the Centers away from development activities with no research content. The SC is confident that a stricter application of the criteria to sharpen the scope of research will open up new opportunities for longer-term impact through strategic research activities.
- There is an explicit focus on income generation among the poor, as well as the elaboration of criteria through which new high-value species and research will be chosen. Livestock, fish and tree products are emphasized as sources of additional income, in addition to their traditional contributions to human nutrition and services to natural and farming systems.
- The CGIAR will prioritize research to raise the contribution of fruit and vegetables to income generation (and nutrition) and explore the possibility of developing of new partnerships.
- There is additional emphasis on market research to promote the participation of the poor, as well as to increase benefits from such participation. Quality and food safety are stressed as targets for commodity improvement, in addition to yield. Research

¹ This Summary Report is based on the Priorities for Research described in "System Priorities for CGIAR Research 2005-2015" (October 2005, Science Council, Rome, Italy, 89p).

needed by poor farmers and poor countries to meet non-tariff barriers in international trade is prioritized.

- Genetic conservation and enhancement activities will be linked to focus on “for use” strategies. New genetic enhancement approaches will encompass the devolution of breeding activities to appropriate NARS and capacity building to enhance the rate of transfer to NARS with currently lower capacity. Developing a genomics platform to help solve problems of particular importance for poor farmers and utilizing the opportunities created by molecular biology are prioritized.
- There is a new major focus on improving key staples for drought tolerance.
- Following the successful establishment of international in-trust collections of plant germplasm, it is opportune for additional emphasis to be placed on research on animal and fish genetic resources to support emerging international frameworks for conservation and use in these areas.
- Also envisaged is a more fully integrated approach to the productive management of natural resources at the landscape and farm levels, with a particular emphasis on water productivity, and the avoidance of degradation and rehabilitation of degraded lands and soils.
- For policy and research management, emphasis is on review, analysis, and planning of research investments for sustainable poverty alleviation, in creating operational environments for the CGIAR and its partners and the optimization of collaborative research opportunities at all levels.

Capacity Building

The CGIAR Priorities maintain the System’s focus on research. However, capacity building is a key activity to meet the overall goals of the CGIAR. Reflecting the CGIAR’s partnership approach to agricultural research, program-associated capacity building, as well as research on institutional strengthening, is considered to fall within the 80% budget allocation. Free standing capacity strengthening for national agricultural research systems that is not an integral part of the System Priorities is considered as falling within the additional 20% of budget allocated for other activities.

Strategic Issues in the Implementation of the Priorities

Cross-Cutting Themes: Considered together, the CGIAR Priorities provide a set of specific goals for a portfolio of research activities around which the CGIAR will organize its scientific and related capacities. The CGIAR will continue, however, to carry out programmatic research on cross-cutting global, ecoregional, or sectoral research topics. In this case, programs will be developed from elements of the 20 research priorities, with any additional research that is needed being provided by partners.

The principal cross-cutting theme is the focus on poverty, which orients the majority of the research Priorities. This theme is woven into research activities from planning, to the conduct of research, to the assessments of the effects of research results—like new agricultural technology, natural resource management practices, or policy—on the poor.

The CGIAR also carries out cross-cutting research on particular topics or regions through Systemwide programs, challenge programs, task forces, and other implementation mechanisms. It is anticipated that additional topical or regional research programs could be formed in the same way, bringing scientific expertise together from across the 20 CGIAR research Priorities for particular issues or periods of time. For example, a coordinated program on nutrition and health could be assembled, drawing on CGIAR strengths in the characterization of genetic resources (Priority area 1), research to improve crop yield and biofortification of grains for micronutrient content (Priority area 2), enhancement of livestock and aquaculture to augment protein supply (Priority area 3 and 4B), the improved management of water (Priority area 4), food safety in relation to storage (Priority area 2C), and markets and trade (Priority area 5). Similar programs could be developed for research challenges of great global significance (such as climate change) or research approaches for particular ecoregions.

Mobilization of New Science: The Priorities are defined by specific goals and the likely scopes of research rather than by technologies. This stems from the Science Council's belief that the CGIAR should use the most appropriate research approach for a particular research endeavor. For example, molecular biology-based research, including, where appropriate, genetic engineering and genomics, will play a major role in future agricultural research in many priority areas. In the planning and development of new research programs, researchers are urged to select the most appropriate approach whether that relates to molecular biology, traditional plant breeding and related research, or agro-ecology.

The changing context for agricultural research and adoption of the new Priorities has strategic implications for the System. Shifts in scientific expertise may be needed in the System in such areas as (i) acquisition of upstream genetic science and the establishment of platforms to relate to global efforts, including the private sector, (ii) new high-value fruit and vegetable crops, (iii) integration of natural resource management research and policy development, (iv) policy and legal affairs related to, for example, intellectual property rights, (v) increased capacity in effecting institutional change, (vi) new social science capacities (or linkages) in poverty analysis, and market analysis and global trade, (vii) post-harvest management and linkages to production chain expertise, and (viii) research management at the consortium level integrating system skills in information technology. The System will have new opportunities for inter-Center consolidation of skills and novel partnering strategies (e.g., in the case of functional genomics and the development of other task forces).

Gender: As strategic Priorities are translated into projects and programs, regional biophysical and social factors should be taken into account. In particular, the gendered nature of agricultural production will influence research in areas with large numbers of women farmers (e.g., sub-Saharan Africa), as well as influencing approaches to defining poor traits for improvement, market chain research, biodiversity conservation, and opportunities for land tenure, among others.

New Partnerships: It is expected that the research proposed in this document will be carried out in strong partnerships with relevant agents. Increasingly these will be national and regional agricultural research systems. However, advanced research institutes and agencies, the private sector, and nongovernmental organizations have a vital role to play in achieving our common goals. Strategic choices in dealing with the “other 96%” of the world’s agricultural research effort will be required, with the nature of the partnerships determined by the particular research. The Science Council is interested in further strengthening the relevance of research through innovation systems and participatory research. The CGIAR Priorities listed above respond to regional and national needs for international public goods research. Collaboration with regional organizations will occur where there is a match between the needs for international collaboration, as expressed by the region, and the CGIAR Priorities. Since CGIAR Priorities have been set with input from the regions and given that the CGIAR has participated in deliberations on regional priorities, considerable complementarities exist between the two sets of priorities. However, since the CGIAR is global, and there are differing comparative advantages in tackling aspects of regional research, a complete match should not be expected.

CGIAR Centers work with selected NARS in their regions and share information globally with many more. All Center programs will be time-bound and increasingly include exit strategies allowing for the products, and the program itself, to be taken over by NARS. It is difficult, however, to prescribe a uniform interaction given variability in the NARS and in the biophysical and human capacity of the states concerned. The existence of strong NARS accelerates opportunities for transferring aspects of research to partners and raises the requirement that the CGIAR not duplicate existing capacities. However, the continued existence of weaker NARS in several regions means that strategic choices (about the speed and staging of research, capacity building, and ensuring regional spillovers from CGIAR research) must be made according to partner strengths. Involving NARS program partners of different strengths in research consortia can enhance opportunities for south-south interactions and regional spillover.

The CGIAR has a major strategic opportunity to involve the private sector in the pursuit of the System’s global goals through the application of private sector biotechnologies in germplasm enhancement. The CGIAR must be fully aware of private sector progress, able to access relevant technologies through partnerships, and able to apply them to the requirements of developing countries, particularly the poor. Elements of a successful strategy need to be integrated from Center to System level, through active research on public-private partnerships utilizing proprietary technologies. Means to develop co-operative public-private research on natural resource and environmental issues may be explored.

Implementing the Priority research will also require that the CGIAR augment its roles as catalyst, integrator, and disseminator of knowledge in the overall global agricultural research system. These roles help build common frameworks for all players (CGIAR, NARS, and other partners) to conduct research in the most cooperative and efficient manner.

Next Steps: Implementing the Priorities

The CGIAR will need to translate the new Priorities into a coherent set of research programs that effectively bridge and synchronize efforts across CGIAR Centers and their partners. Finding the proper balance between the different CGIAR operating modes—including Center core programs, Systemwide or Ecoregional Programs, Challenge Programs, and Task Forces—remains a considerable challenge. Over time, the distinction between these different modalities may become more blurred. Nevertheless, in the short term, decisions about the appropriate programmatic modality for accomplishing specific objectives will need to be made at the same time as research programs are being defined.

In order to provide coherence at the System level, the SC proposes the engagement of CGIAR Centers and other stakeholders in implementing the Priorities for research directly following their endorsement. The elements of the approach will include (i) establishing a small working group with representation from CGIAR stakeholder groups to jointly develop the strategy for implementation, (ii) reviewing in detail the current allocation of Centers' efforts and budget to Priority research and conducting a gap analysis between current CGIAR research and Priority research, (iii) reviewing the efficacy of research vehicles for addressing Priorities (Systemwide Programs, Challenge Programs, virtual Task Forces etc), (iv) developing a CGIAR strategy for gap filling in terms of scientific disciplinary expertise, consortium building, and the mobilization of science, and, (v) the implementation of the new System Priorities would be facilitated by a System-level funding mechanism, which would complement current bilateral approaches.

Centers are expected to make evolutionary, not revolutionary, changes in their science strategies. To adjust to these Priorities (and to further refine them in the process), it is proposed that during the years 2006-2008 the Centers undertake a program alignment through Medium-Term Plans (MTPs) and SC review of individual Center, Challenge Program, and Systemwide Program MTPs. The SC will conduct a dynamic review of the Priorities, using strategic studies and extending the consultative processes pioneered in this exercise. Center-driven innovation and progress, as reflected in the MTPs, will also play a major role in the evolution of the System Priorities. The SC expects to update the System Priorities approximately five years from now and to carry out a major review of the Priorities in 10 years' time. In addition, ongoing monitoring by the SC will aim to identify promising new opportunities for enhancing the impact of CGIAR research.